

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte DUNCAN L. MACFARLANE

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Appeal No. 96-2744  
Application 08/004,734<sup>1</sup>

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ON BRIEF

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Before THOMAS, KRASS and CARMICHAEL, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

**DECISION ON APPEAL**

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<sup>1</sup> Application for patent filed February 10, 1993.

Appeal No. 96-2744  
Application 08/004,734

This is a decision on appeal from the final rejection of claims 6 through 8, 10 through 31 and 40 through 56, constituting all the claims pending in the application.

The invention is directed to a three-dimensional monitor which employs a three-dimensional array of discrete volumetric optical voxels containing dye which emits light in response to stimulation by electromagnetic radiation.

Representative independent claims 6 and 10 are reproduced as follows:

6. A voxel, comprising a normally transparent, discrete volumetric display element adapted to emit light in response to stimulation by electromagnetic radiation.

10. A monitor for displaying electronically generated images in three-dimensional space, comprising:

a three-dimensional array of discrete volumetric optical voxels;

a plurality of transmitting conductors, each transmitting conductor coupled to a respective voxel; and

an energy source coupled to the transmitting conductors, adapted to provide energy that causes the voxels to emit visible light when the energy is conducted to them through the transmitting conductors.

The examiner relies on the following references:

Soltan et al. (Soltan)	4,299,447	Nov. 10, 1981
Gery	4,525,711	Jun. 25, 1985
Abe et al. (Abe)	4,883,338	Nov. 28, 1989
Zuchowski et al.	5,024,521	Jun. 18, 1991

Appeal No. 96-2744  
Application 08/004,734

(Zuchowski)		
Müller et al. (Müller)	5,082,378	Jan. 21, 1992
Nixon	5,293,437	Mar. 8, 1994
		(filed Jun. 3, 1992)

Claims 6 and 46 stand rejected under 35 U.S.C. 102(b) as anticipated by Gery.

Claims 7, 8, 10 through 31, 40 through 45 and 47 through 56 stand rejected under 35 U.S.C. 103. As evidence of obviousness, the examiner cites Gery and Nixon as the basic combination against claims 7, 10, 11, 14, 16, 18, 20, 21, 23, 25, 27, 29 and 54, adding Abe to this combination with regard to claims 13, 19, 28 and 55, adding Müller to the basic combination with regard to claims 12, 17 and 24, adding Zuchowski to the basic combination with regard to claims 15, 22 and 30 and adding Soltan to the basic combination with regard to claim 26. With regard to claims 8 and 47, the examiner cites Gery and Abe. The examiner cites Gery, Nixon, Abe and Keil with regard to claims 40, 41, 44 and 56 and cites Gery, Nixon, Müller and Soltan with regard to claim 31. With regard to claims 45, 48 and 49, the examiner cites Gery and Keil. Gery, Nixon, Abe, Keil and Soltan are cited with regard to claim 42 and Gery, Nixon, Abe, Keil and Müller are cited with regard to claim 43. With regard to claims 50 through 53, the examiner cites Gery, Nixon, Abe and Müller.

Appeal No. 96-2744  
Application 08/004,734

Rather than reiterate the arguments of appellant and the examiner, reference is made to the briefs and answer for the respective details thereof.

#### OPINION

We turn first to the rejection of claims 6 and 46 under 35 U.S.C. 102(b).

Anticipation, under 35 U.S.C. § 102, requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference. Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed. Cir. 1983).

The examiner has applied Gery to the claimed invention by calling the tip end 36 of the optical fibers a "voxel," indicating that the fiber tips take up some volume in space and, therefore, constitute "discrete volumetric display" elements, as claimed. Further, these fiber ends emit light in response to stimulation by electromagnetic radiation, i.e., the light, which is electromagnetic radiation, at the input end of the fiber is output at the end tips 36. The display in Gery is clearly three-dimensional.

Appellant contends that the fiber tip ends 36 in Gery are not "discrete volumetric display" elements because the ends of

the fibers are point sources of light and, as such, are only two-dimensional. Therefore, contends appellant, these fiber ends cannot be "volumetric" in nature and claims 6 and 46 are not met by Gery.

We have carefully reviewed the arguments and evidence regarding this issue and, while we commend the examiner for a well-written answer and a reasonable rejection, we find ourselves in agreement with appellant.

The ends 36 of the optical fibers in Gery must be considered as being only two-dimensional, and not three-dimensional, i.e., having some volume, as required by the instant claims, because even Gery, himself, describes the exit tips of the wave guides, i.e., optical fibers, as "illumination points" [emphasis ours-see Gery's abstract]. Points of light are not three-dimensional; they have no volume and, so, cannot be considered to be discrete volumetric display elements, or voxels, as required by the instant claims.

The examiner disagrees, contending that the individual tips of the fibers are volumetric display elements because each tip "is a physical element which occupies a certain amount of volume in space" [answer-page 12]. We would agree if the tip of each fiber had some third dimension to it but the tip actually lies in

a two-dimensional plane and the emitted light is seen from that two-dimensional tip. Now, while the examiner has not suggested this, one might consider that since there is usually some light leakage from a fiber, especially in transparent fibers with which Gery is concerned, and light is emitted from other parts of the fiber, the whole, or a certain portion of, the fiber might be considered a "discrete volumetric display element." However, such an interpretation would require the entire fiber to be a display element which it is not. Undesirable light leakage from a fiber cannot, in any way, be considered controlled in the sense that a display element is controlled. Therefore, we are back to only the fiber tip emitting the desired light as constituting the display element and the tip of the fiber, in our view, is not a "volumetric" display element.

It is also interesting to note that, while not part of the rejection against claims 6 and 46, Nixon, in the abstract thereof, indicates a "plurality of pixels formed by optical fiber ends..." Thus, in related art, it is recognized that optical fiber ends, such as elements 36 of Gery, constitute pixels, i.e., two-dimensional picture elements, and not voxels, i.e., three-dimensional picture elements.

Appeal No. 96-2744  
Application 08/004,734

Accordingly, we will not sustain the rejection of claims 6 and 46 under 35 U.S.C. 102(b).

We now turn to the rejection of the remainder of the claims under 35 U.S.C. 103.

We will not sustain the rejection of the claims under 35 U.S.C. 103.

Each of the independent claims, with the exception of claim 50, requires a "voxel" or "volumetric discrete voxels," or some similar recitation. The rejections of the claims all rely on Gery for the teaching of such volumetric discrete voxels. However, as we indicated supra, such voxels are not taught or suggested by Gery. While the other references are applied for various other reasons, regarding other claim limitations, we have reviewed these references and find that none of them provides for the deficiency of Gery in this regard. Accordingly, the claimed subject matter would not have been obvious within the meaning of 35 U.S.C. 103.

There is a different issue with regard to independent claim 50 and the claims dependent therefrom because claim 50 does not require a voxel, or volumetric discrete display elements. Rather, it calls for a three-dimensional array of normally substantially transparent optical display elements which read on

the fiber end tips of Gery. It calls for a "plurality of optical waveguides coupled to the display elements for conducting light energy to the display elements" and this is the function performed by the fiber optic cables of Gery. The claim also calls for "a modulated light source coupled to each waveguide for selectively providing light to be conducted to the display elements" and this is clearly taught by Gery. See the abstract of Gery where light source locations are coupled to the input ends of individual fibers and the points to be activated are processed by a computer to activate selected light sources to produce a desired pattern in the display region. Claim 50 also calls for "an index matching medium substantially surrounding the display elements and the waveguides." We agree with the examiner that in view of the teaching of Müller of index matching to avoid reflections [column 1, lines 37-39] in fiber optic cables, the artisan would have been led to provide for such index matching in Gery.

The problem, as we see it, with the examiner's rejection of claim 50 is with the requirement in the claim that each such display element must comprise "a bead of resin doped with a dye that emits visible light when stimulated by light energy." None of the applied references suggests any such "bead of resin." The



examiner cites Abe for a teaching of providing synthetic resin in an optical fiber in order to change color of the light and contends that it would have been obvious to employ such a teaching in Gery. To buttress this position, the examiner points to column 1, line 67 to column 2, line 4 of Abe. This section recites that a synthetic optical fiber is known wherein such a fiber comprises a core and cladding around the core, both of which are colored by containing organic dye to provide a wavelength filtering property. Abe also teaches that only light of a specific wavelength is transmitted through the synthetic resin optical fiber [column 2, lines 4-6]. This indicates that the light passing along Abe's fiber and out the end is changed in color by the synthetic resin-dye. However, an analysis of the remainder of the disclosure of Abe appears to indicate that the resin doped with dye is provided in the core and cladding to prevent light leakage from the sides of the optical fiber. Thus, we conclude from this understanding of Abe, that it would not have been obvious to the artisan to treat the output tip of Gery's fiber which emits the light (and it is the output tip of the fiber that the examiner has identified as the optical display element in Gery) with a bead of resin doped with a dye. As appellant states, at page 3 of the reply brief, "Abe discusses

Appeal No. 96-2744  
Application 08/004,734

coloring an optical fiber, thereby making it nontransparent...the nontransparent cladding of Abe absorbs electromagnetic energy, whereas the transparent synthetic resin voxels of Appellant's invention absorb electromagnetic energy and emit light in response thereto." Therefore, we find no suggestion in Abe for treating the fiber ends 36 of Gery to provide "a bead of resin doped with a dye that emits visible light when stimulated by light energy," as required by claim 50.

Appeal No. 96-2744  
Application 08/004,734

The examiner's decision rejecting claims 6 and 46 under 35  
U.S.C. 102(b) and rejecting claims 7, 8, 10 through 31, 40  
through 45 and 47 through 56 under 35 U.S.C 103 is reversed.

REVERSED

JAMES D. THOMAS	)	
Administrative Patent Judge	)	
	)	
	)	
	)	
ERROL A. KRASS	)	BOARD OF PATENT
Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES
	)	
	)	
JAMES T. CARMICHAEL	)	
Administrative Patent Judge	)	

Appeal No. 96-2744  
Application 08/004,734

Donald G. Jones  
Arnold, White & Durkee  
P.O. Box 4433  
Houston, TX 77210